The CORNELL ENGINEER

In This Issue:

MY EXPERIENCE IN THE N.R.A. *By H. S. Jacoby, C.E. '08*

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THE CORNELL ENGINEER

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COMMENTS

Hurlbut S. Jacoby's article is most timely, measuring intimately and familiarly the pulse of the National Recovery Administration. Every engineer at some time or other is apt to be called for work of broader range than his profession holds in its own right; and in an industrial democracy the chances are excellent that he will be asked to offer his training and experience for the development of politics and statecraft. Mr. Jacoby's story recounts for us some of his trials and triumphs at Washington.

* * *

"Is the Working Man Safe?" is condensed from a talk given by the author, Frederic C. Evans, before the local branch of the A.S.M.E. on May 14, 1936. Many articles appear on the problem of industrial safety, but it is the editor's opinion that there is still much to be said and done.

* * *

Professor Bangs appears again this time with a discussion of the problems confronting the engineer in predicting and providing for sociological changes.

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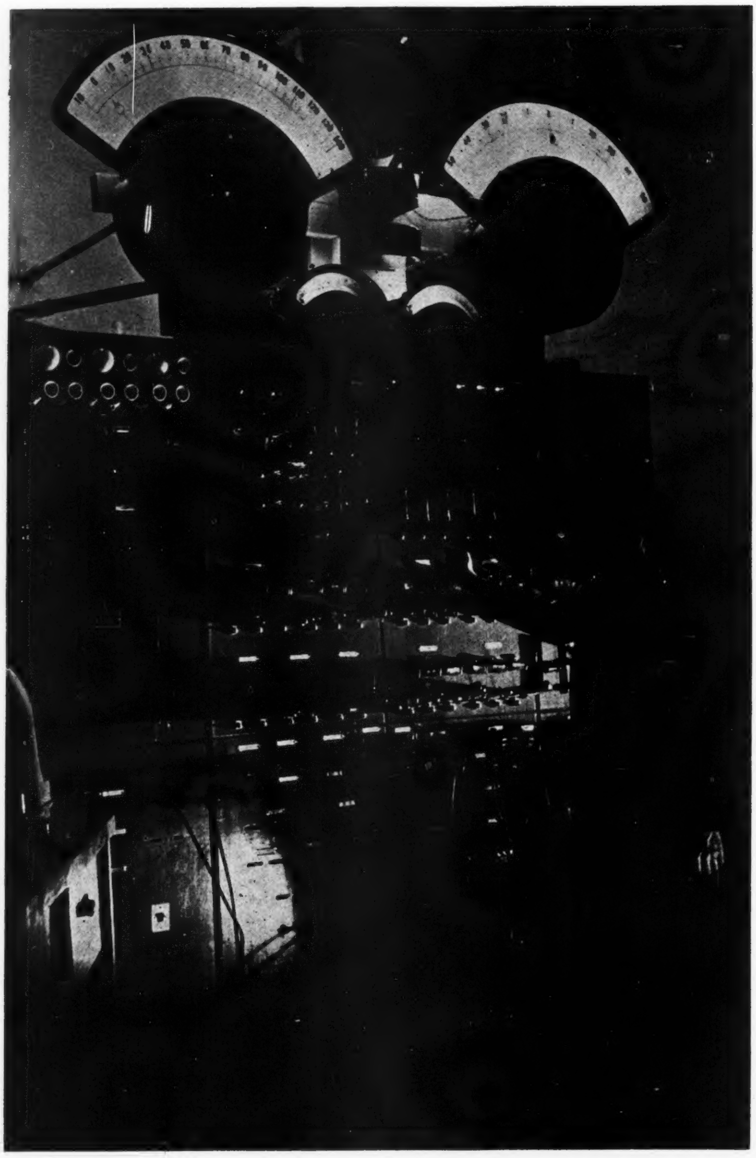

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SWITCHBOARD—FRANKLIN LECTURE ROOM

The
CORNELL ENGINEER

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My Experience In The N.R.A.

By Hurlbut S. Jacoby, C.E. '08

Director of Industrial Research,
Field Director, Engineering Experiment Station
Ohio State University

"We demand the right to be heard," and from another crowd, "We have some from New York and Baltimore to attend this hearing." With men swarming the corridor of the Commerce Building after the small conference room was filled, my only answer was that this was a private party and not a public hearing. But considerable argument followed about the proposed wages, the representative character of the committee and other less important items, and it was only after a definite and sincere promise to keep labor advised that I succeeded in returning to a quiet session with the group of employers sponsoring the code of Electrical Contractors and to my board of advisers. This was my introduction to the National Recovery Administration.

GENERAL HUGH S. JOHNSON

Before entering Deputy Malcolm Pringle's office I was impressed with the prompt action and the enthusiasm apparent among all employees. Men of importance were at their desks ahead of time, dashing young girls were already typing, and Pirnie greeted me on the dot. Entering government service through the door of another civil engineer was far different from the usual procedure. After a few pertinent questions and answers he turned to me, "How soon can you start?" It was Monday, and I figured that to clear up my business affairs in Cleveland and square myself with the family would take the balance of the week. "That won't do," he replied. "Here are six codes for you to start on at once."

In the life of any engineer there is apt to be a short period that is quite apart from his life work. This may form a transition to other fields of activity or simply act as a breathing spell from his regular duties. It is only because my "breather" was so valuable to me that I feel justified in recounting some of my impressions in a venture which may for the moment be dead but which I am convinced will be reflected in considerable good results over a period of time.

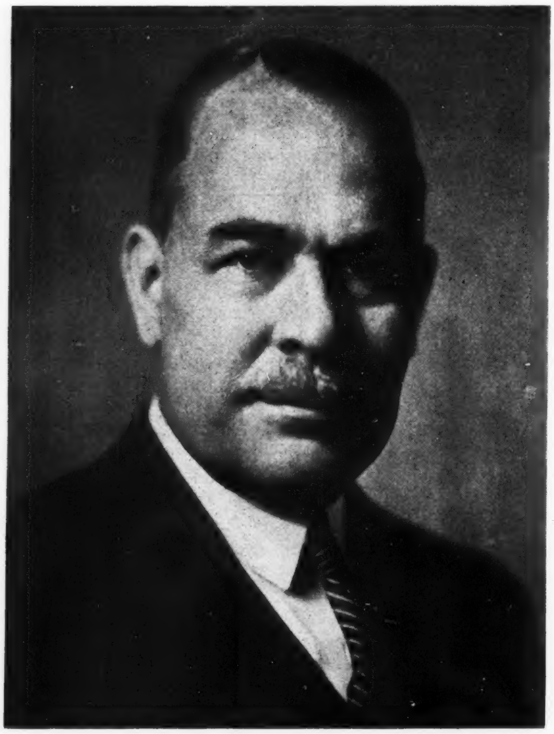
Six large files were soon on my desk, and I discovered that I would be dealing with men who manufacture bath tubs and other plumbing fixtures, those who wholesale these products, and the plumber himself who goes back for his tools to install them. In addition to my electrical contractors, I was to determine the fate of the quarrier and finisher of marble for building purposes as well as the stone setter. It was soon apparent to me that these files simply indicated various stages of development. Some

industries had merely submitted preliminary drafts of a code, others had appeared in public hearings, while others were in the conference stage. My immediate job was to discover quickly what needed first aid. I chose the Electrical Contractors. And I soon realized that it was the employers in Industry, not the employees, who were sponsoring all codes.

WANTED—A CODE

It was quite apparent that Industry really wanted a code of fair competition. Representatives of large national corporations as well as small concerns voiced their request. "'Give us a code, we need it in our business." Given a code prompted by unselfishness, administered by fair-minded business men, and enforced by government aid, I was convinced that many of the ills of our industries would be cured. But I fully realized that to accomplish this was a stupendous job. To put down on paper the essentials acceptable to all concerned could not be accomplished in any short time. Monopolistic trade agreements, unfair business tactics, and unreasonable wages had been too firmly established to be wiped out by any quick stroke of the pen.

The men who came to Washington to represent the crowd back home were the pick of the Industry. Former Governor Kohler, short of stature and dignified, weighed his words carefully and knew whereof he spoke. His fortune, resulting from Kohler bathrooms, built the beautiful town bearing his name, in Wisconsin. With him was Keith McAfee, likewise dignified and cautious, representing one of the smaller plumbing manufacturers. It was essential that the committee show credentials that they were truly representative of the entire industry, that they were permitted to present a code, and empowered to give final assent to the completed document.



PIRNIE
Fair-minded Engineer and Executive

THE INNER CIRCLE

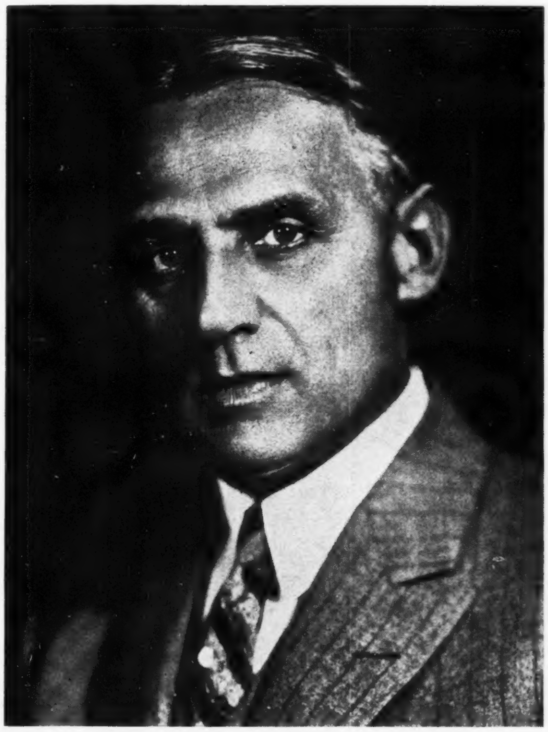
Suppose we picture the steps in the preparation of the code—this little document with so many possibilities. In preliminary conference with members of advisory boards of N. R. A., each Industry has an opportunity to present its proposed code. Here the Assistant Deputy Administrator is in charge of all details. It is essential that the proposed code meet the requirements of the Act itself—the N. I. R. A.—and that it conform to the policy of the Administration.

One is impressed with the spirit of cooperation which exists. Various members of the boards are willing to meet with the industry committee in the evening, in the building or at a hotel room. Gongs in the corridor announce four-thirty and five o'clock but no one moves—everyone knows that there is a job to be done as quickly as possible, that many men are affected by the action of our small group. Here the example of the General is reflected in the spirit and effort of his associates. After a long day of conferences and decisions, Hugh S. Johnson is leaving the Commerce Building only to return for committee meetings in the evening.

Is it legal? While that ruddy-faced, sharp-featured lawyer, John Gallagher, is bending every effort to help the plumbing manufacturers in their chain store problem, the consumers' interest is protected through the efforts of Stuart Heinritz. John sees to it that constitutional rights are not overlooked and that the Act is followed, specifically sections 7 (a) and 10 (b). The former gave labor the right to organize and bargain collectively through representatives of their own choosing and freedom to join any labor organization of their own choosing or to refrain from joining any company union. By the latter, the President was empowered to cancel or modify any order or regulation issued under the Act.

True, our lawyer is interested to see that there is no tendency toward monopoly, and no discrimination against small enterprises. He pays particular attention to the members of the code committee to be sure that they truly represent the industry. But his main task is to see that the finished document is legal, that when put into operation as a law, it will work.

From the start of all negotiations it pays to see that the small industries are amply represented on the committee. Sooner or later their interest will be protected. Even though the small group is swayed by the masterly manner of Henry Reed, president of the Standard Sanitary and Manufacturing Company, who realizes the import-



KOHLER OF KOHLER
Successful as Governor and Manufacturer

ance of distribution through jobbers to licensed plumbers, Heinritz sees to it that the consumer is not harmed in the transaction and that price discrimination is avoided. Sullivan Jones, that mature architect from New York City, represents the Industrial Board. From actual experience he appreciates all angles of the plumbing business. He watches Industry's interests, and although it might appear that his efforts overlap those of Heinritz, it is only from the viewpoint of the smaller operator, perhaps, whose transactions are reflected in consumer benefit. Jones reflects the benefit derived from constant association of such members of the Board as Averill Harriman, General Wood, and Alfred Sloan.

Just as the library and a search of literature are essential to the research worker, so the Research and Planning Division is useful in code formation and operation. Digging out authentic data and information in all industries, this department is in position to be of definite help to all concerned. Kenneth Dameron, that young professor at Ohio State University with a background of study and experience in merchandising, is interested in the flow of goods from raw material to the consumer and acts as a safety valve in the distribution of plumbing goods. Naturally he protects the interest of the chain store and direct-to-you channel of trade—if they need help.

The Voice of Labor

Labor is intimately related to the fundamentals of N.R.A. With a universal reduction of working hours and the raising of wage rates, it was hoped that an increase in the total volume of employment would result and in turn an increase in wage disbursements. Child labor would be eliminated. The 40-40 rule seemed to be a reasonable standard for most codes, *i.e.*, 40 hours per week maximum and 40 cents per hour minimum. It was generally agreed that a differential between wages paid in the north and those paid in the south was justifiable and essential to fair competition. In some instances a universal wage rate was quite acceptable to southern interests.

Very few codes permitted the use of labor under 18 years of age, and no one under this limit could be employed on hazardous occupations. Such a regulation met with very little opposition. Who wanted to stand out in favor of child labor when adults were out of work?

Who was interested in these provisions? Certainly Labor itself, and Labor was well represented by the Labor Board, by representatives of labor unions, by Frances Perkins, Secretary of Labor. The Master Plumbers of America took no chance, and telegrams poured in to me from all sections of the country. The cost to each sender was small, but the effect of the combined effort was appreciable and received plenty of attention.

That section 7 (a) was one of the most disputed provisions in the Act and one on which Labor rested her case. This calls for collective agreements between employers and employees as to hours and wages. The 40-40 formula was a good start but 7 (a) was Labor's instrument to keep in line.

The Public Hearing

When we agree that the draft is in proper shape for the public hearing, a time and place are arranged to permit about two weeks' notice and accommodate the probable audience. Large hearings are usually conducted in the auditorium on the first floor of the Commerce Building. Printed notices are sent to all known members of the Industry, are carried in important newspapers and hung on the bulletin board of postoffices throughout the country. At ten o'clock of the appointed day the meeting is called to order by my serious-minded and more serious-faced deputy, Hickling. (Malcolm Pirnie had returned to his business in New York.) He opens with the formal statement, "This is the hearing on, *etc.*" Sitting at his right, I could interpret any of the agenda prepared by my energetic aide, Charlie Carrigan. Someone might question the tact of Charlie, but no one could question his desire to get things done at all hazards. At the table sit the various board advisers who have labored through the preparation of this particular code. Lawyer Gallagher explains that this is not a judicial trial nor a legislative inquiry, but simply a fact-finding gathering. Solomon Barkin is fortified by one of his union delegates. At our feet in front of the platform are the official reporters who

insist upon every filed brief and clear enunciation on the part of all witnesses.

The hearing is rather matter-of-fact with a little humor on rare occasions. It is not necessary to read the proposed code as it is available in printed form. The chairman of the code committee gives an idea of the size and scope of the Industry, the problem which it faces, and the results which they hope to accomplish. Usually adjourning at noon, the Assistant Deputy meets the Industry committee and the board advisers in an informal conference to discuss major issues and decide on a plan of procedure. At this point the chairman of the code committee may decide to remain in Washington or return alone after a short interval, thus giving the advisers time to render their final reports.

The Little Fellow

I have tried to indicate that the oppressed members of an industry have recourse to be heard. This is a fact all along the line. All mail, whether marked personal or otherwise, is opened and censored in the administrative office. This insures that objections on the part of anyone are not overlooked or intentionally discarded. If the small manufacturer is not protected in the preliminary negotiations, he appears in person at the public hearing or files his complaint in writing. Even if he fails to object until the code is accepted by the industry and ready for final printing, relief is possible in the executive order approving the code on the part of the government. Finally, if any member of the industry feels that some provision will work a hardship on his concern and he has not been aware of such provision, he may avail himself of the President's order permitting him exemption from this particular rule pending a hearing and definite disposition of the case.

The General Himself

Were you to multiply my small group by tens, by hundreds, and in the case of industry representatives, by thousands, you might appreciate the organization that came to Washington in this supreme effort. It was interesting to note that men such as myself, who had never had occasion to enter politics, were enthused in work which was conducted on the business basis that pervaded the N. R. A. True, in many cases administration officials were attempting to guide the actions of men in fields which were entirely foreign to them. But as I look back on it all, it was perfectly logical that the builders and architects, those civil engineers, Weed, Dougherty, Crosley, and Giles, should be handling the essentials pertaining to certain construction industries, while others were readily adapted to executive work. And out in front of this army was General Hugh S. Johnson, who deserves the credit for the organization and who, through his enthusiasm and hard work, maintained the loyal support and diligent performance of every member of N. R. A. Gathered together on various occasions in the auditorium for short talks by the General, we were impressed with his sincerity and his candid instructions. Little wonder that at that memorable meeting when the General gave his farewell talk, sobs were heard and he ended a little sooner than planned with "God bless you."

After A Code—What?

Tremendous expense was involved by industry in perfecting a code, and heavy costs were necessary to administer the law even before the government was drawn into any dispute. And here, as in the case of any pioneer, the industry that organized first with its so-called "Code Authority" was subject to more expense than those that followed. Take the case of that universal and commendable provision that no concern was permitted to sell below its cost. This necessitated a manual for the purpose of figuring costs on a universal basis. This manual was expensive for those who developed it from the start while later on it became standardized and was given the help and approval of government agencies. This is just one problem of many which was important and real to all Industry and which was being solved. And today we find one important national industry that is arguing its case in the courts involving the very problem of "selling below cost."

Some have said that N. R. A. and codes were all right as far as hours and wages were concerned but that this is as far as it should go. On the other hand, we see at the present time one of the largest steel companies in this country coming out for open published prices to eliminate the unfair trade practice of price discrimination and secret rebates in that industry.

True, there were many new problems brought about by code restrictions. In a small town in Ohio where trained machinists were not available, it seemed unreasonable to import a few specialists from distant cities for simply a few hours overtime work beyond the prescribed forty hour week. For some small companies the time and expense required to prepare cost data was excessive. With the small differential in wages, certain southern manufacturers were unable to compete with those in the north.

I am convinced that N. R. A. was the start of an effort that will answer the industrial problems of our country. Certain trade practices of the past which tend to freeze the channels of trade and work a hardship on the consumer will gradually be eliminated. Furthermore, by the intelligent study of the level of prices and the effect on the movement of goods, the facts will be available for suggested changes to improve any price provisions. Similarly, labor and other phases of our industrial life can be treated in a sane, common-sense manner through provisions initiated by N. R. A. but developed and revised to improve as we move along. Today the emblem of the blue eagle may only be seen in the old work shirt or the letterhead, since replaced, but some of the principles of N. R. A. are too valuable to be discarded by any industry.

Is The Working Man Safe ?

By Frederic C. Evans, ME '19
Baltimore Plant Manager
E. I. DuPont de Nemours and Co., Inc.

Having children in school brings the realization that one of these days, the industrial safety problem is going to be simplified by having employees who have been soundly grounded to general safety by the public school system. But there will still be a safety problem. Their minds will have been prepared but we will have to surround them with safe working conditions and guide them to maintain their standards.

Before discussing industrial safety more intimately, I will give a picture of the significance of this problem.

Accidents and Accident Rates in the Iron and Steel Industry — 1913-1926

Bureau of Labor Statistics—No. 490

Year	Full year workers	Deaths	Frequency rate	Severity rate
1913	319,919	426	59.6	4.3
1914	256,299	219	50.0	3.2
1915	116,224	87	40.0	2.7
1916	166,642	139	43.0	3.3
1917	410,852	523	47.7	4.0
1918	474,435	543	39.4	3.6
1919	377,549	419	41.6	3.6
1920	442,685	327	38.3	2.7
1921	237,094	156	30.8	2.5
1922	335,909	236	33.0	2.7
1923	434,693	314	33.2	2.7
1924	389,438	312	30.8	3.0
1925	443,138	277	28.3	2.5
1926	436,261	322	25.3	2.9

Frequency rate = number of lost time injuries per 1,000,000 man hours worked.

Severity rate = number of days lost per 1,000 man hours worked. Or, put it another way; a severity rate of 2 means one day lost per year per employe.

The following statistics are given to indicate that more can be done in the future in the country as a whole. Many companies are worse than the Iron and Steel Industry statistics indicate. From personal experience I have even undertaken the dangerous act of setting a goal which is not unattainable and which we may all live to see surpassed by average industry.

1929 — *Industrial Accident Statistics*
National Safety Council Industrial Accident Statistics
1930 *Edition*

Industry	Number Employees	Fatality Rate	Frequency Rate	Severity Rate
Automobile	143,650	0.0462	22.17	0.97
Cement			9.54	3.64
Chemical	79,270	0.184	17.50	1.72
Construction	55,424	0.495	50.41	4 62
Foundry	163,774	0.112	30.30	1.73
Machinery	184,114	0.0448	18.91	1.11
Rubber	77.750	0.0856	19.25	1.24
Textile	83,847	0.035	11.82	0.58
Goal		0	2	0.5

Fatality rate—number deaths per 1,000,000 man hours worked.

The humanitarian angle is of course the obvious incentive we have. To many, this is sufficient justification, but there are others. The work can be justified on a savings basis which in this materially minded world speaks loudly. All states have compensation laws of various types. This, together with medical and hospital expenses, are the direct cost of accidents and the indirect costs which are estimated to be four times as great, are added to the above expense.

Indirect Costs are suggested by the following items:

(1) Cost to employe of difference between compensation and regular wages.
(2) Cost of time of other employes who stop work
  a) Out of curiosity

b) Out of sympathy
c) To assist the injured employe

(3) Cost of time lost by foreman, supervisors, or other executives as follows:
a) Assisting injured employe
b) Investigating the cause of the accident
c) Arranging for the injured employe's production to be continued by some other employe
d) Selecting, training, and breaking in a new employe to replace the injured employe
e) Preparing State accident reports, or attending hearings before State officials

(4) Cost of injury to the machine, tools, or other property or to the spoilage of material

(5) Cost to employer under employe welfare and benefit systems

(6) Cost to employer in continuing wages of the injured employe in full after his return, even though his services for a time may be worth only a portion of their normal value.

In passing, compensation is poorly named. It is not recompense to the man for having injured him, but rather social requirements to limit suffering and distress from loss of wages.

The present direct costs may not be the future. The trend is certainly upward rather than downward and the sooner the house is put in order, the more benefit to all. Beyond compensation law lies common law which may infrequently lead to more direct costs. In many if not all states, employes may secure damages beyond compensation by proving the employer was liable by not providing proper safeguards. A jury trial is usually not sympathetic to the company. I recently visited a company which has under-floor pits for the storage of hot molten material. These pits are covered with steel doors flush with the floor. The superintendent told me his men were ordered not to walk on these as they might weaken underneath. Should a man fall through and die, however, the defense in court would be weak as oral instructions may miss some individuals. Suitable signs warning danger should constitute better defense and a simple railing around the dangerous area would probably constitute a very good defense case.

With greater appreciation of the problem will come public sentiment against accident. This might very conceivably result in further complications from the government. It is certainly sounder to combat sentiment for further regulation by industry as a whole tightening up so that they will not cause unnecessary social distress.

Must we accept a death per $1,000,000 of new construction? Examination of ladders, rigging equipment, tools, etc., used by many reputable construction firms leads one to doubt the necessity of accepting such fatality rates. And beyond that lies the possibility of life nets for steel workers already used on a major job and other enlightened advances that must be economically worked out by you. Let me illustrate. We have had experience with two rigging firms. One foreman had a crew who prided themselves that they could take it. One member had fallen 40 feet and knew how to land so that all he did was break both feet and was fortunately not permanently crippled. The foreman himself on our job kept one of my tile walls from being broken by cushioning a swinging heavy iron ball with his own body. He could take it too, and continued at work with his cracked ribs. Nevertheless, both occurrences were probably unnecessary and due to carelessness.

Another rigger foreman has done even more work on our plant and from general observation I would say that he has done it more economically. He has never lost a man in all his experience nor injured a man on our plant so that the man had to lose time from work. I wonder if the following is the reason. One day as I was passing, he was lowering a three ton filter from the third floor to the ground. One of his men walked under the suspended load to adjust a cable. With some necessary omissions, I would quote him as follows: "You may not care whether you break your neck, but I do. Don't ever do that again on one of my jobs."

Safety rules must be promulgated, not so elaborate as to be unenforceable, but the result of long and serious consideration that they are fundamental. Many accidents are avoided today by foresight in the use of goggles, shoes in proper repair, or possibly safety shoes, clothing in property repair, steam hose limited to temporary use under proper supervision, safety showers, etc. A couple of incidents come to mind. When we first introduced safety shoes in the plant, I loaned a pair of mine to a foerman for inspection. He certainly (and unnecessarily) had faith in me, for he tipped over a loaded barrel on the toe while his foot was in the shoe to prove the effectiveness! Again, a man unloading fuming sulphuric acid in disconnecting the line from the barge, received a splash of oleum in the face. He had his goggles on, in accordance with instructions, and had only to run about twenty feet to dash under a safety shower. He looked like a drowned rat when he applied for first aid but wound up with only a slight burn on one cheek which did not incapacitate him from work. How different from a man in another plant who spent months in a hospital and will always be disfigured from general burns with the same acid. These burns would have been avoidable had he received proper instructions and had he used proper equipment.

This brings up the point that it is too late to think about the corrective measures after the accident has

occurred. Foresight is even more difficult and is a mark of real achievement. The old saying is that "It is too late to lock the barn after the horse has been stolen."

If you inspect a firm that has an established safety policy you will also be interested to see how management has settled the questions of discipline to secure results, organized safety meetings, self insured for savings if their program is effective and their operations are large enough, handled their medical policy and first aid, etc.

Medical examinations are a definite safety aid. A hiring examination followed by annual re-examinations may bring to light the following conditions. An employe who never has fainted may be shown subject due to a changed physical condition. Then a job on the ground, away from moving machinery, is indicated until the condition responds to that treatment if it is correctable. I have seen exactly this occur. An employe in a plant in which I formerly worked was diagnosed as having an ailment which indicated sudden collapse. His work was changed and when he did collapse, no accident occurred. Work around lead dust, silica dust, etc., is essential in some industries. A periodic check can be kept of exposed employes and correction steps taken at the first signs of disease which will cure the man. Safe working conditions are an important factor also. Even States which do not require compensation for occupational diseases do in effect require compensation be paid since the court has interpreted that the conditions are the result of an accident.

The purpose of all this is merely to give you a vision on which to build for the future along a line essential to industry, but probably not thus far presented in much detail.

The Engineer and Social Science

by John R. Bangs, ME '20
Professor Industrial Engineering
Cornell University

For many years the engineer has been trained primarily in the physical sciences and much of his success has been due to his ability to apply these sciences to the design and development of technical devices in industrial enterprises. Curiously enough, this same training has given him an entree to the managerial side of such enterprises, and we find that three-fifths of all engineers who live a normal life span spend over one-half their working lives in administrative work of a technical or general nature.

But so often engineering, considered in this broader light, fails to complete its job. It does not carry through to the ultimate conclusion. It releases, or causes to be released, forces which bring about radical changes in materials, and in production methods and products, which in turn require new methods in marketing and distribution. In other words, these forces, although primarily technical, bring about sociological changes which seriously affect the work and lives of men.

A good illustration of this is what happened in two southern textile mills when the automatic loom was introduced. Professor Elliott Dunlap Smith, Director of Industrial Investigations in the Institute of Human Relations at Yale University, describes this most vividly. Both mills were relatively small, each employing about a thousand workers; both were located in small villages where modern sanitary conditions were unknown. Considered social outcasts by nearby city dwellers, the mill workers labored 12 hours a day and 60 to 70 hours a week, earning from twelve to fourteen dollars weekly. Unsanitary working conditions coupled with slovenly methods made their lot no better. This was the situation when competitive conditions forced the introduction of the automatic loom.

The management of one of these mills exercised vision and foresight by planning to engineer through to the end. Technicians were brought in who studied the problem of improving materials, methods, and conditions. A higher grade of managerial personnel was hired, and better organization was introduced. The mill was given a thorough housecleaning and the mill village was improved. As efficiency rose, hours were shortened and rates of pay advanced. But wait, they went even further. The new efficiency was carried past the processes of production to include distribution. New marketing methods were developed; new products were manufactured and sold. In other words, the job was engineered from start to finish—engineered technically, economically, and humanly.

The whole process was gradually evolved; in fact, so carefully was it put into operation that no workers were dropped, the gangs being reduced by normal separations. In spite of the fact that in just a few years a

weaver was operating not one loom but one hundred and ten, the looms were operated efficiently and there were no undue hardships or unrest involved. To be sure, this is an outstanding example, but other studies have shown that such results were normally to be expected when management performs a completely engineered job.

In the second mill affairs were different. No study was made of the possible consequences of the introduction of the automatic loom; no concern was shown about working conditions, housing, pay, managerial personnel, or marketing methods. Workers were forced to operate more and more looms under old working conditions. Soon trouble became imminent, and a mill that had never had labor troubles before soon found itself in the midst of a strike which took its painful toll during many heart-rending weeks.

Unfortunately there has been more engineering of the second kind than of the first. To blame this failure to carry through on the engineer as a technician is hardly fair. But when he assumes the role of administrator the picture changes, and with it must change his vision. He now becomes responsible not only for technical changes, but also for the effect of such changes upon the workers and the consuming public. His job becomes one of coordinating the efforts of technical, production, and marketing experts. And, carrying through to the end, he may need to consult the psychologist, the psychiatrist, or the sociologist.

Certainly this is a change in our conception of the engineer as simply a technical expert. Even the engineers of the past with their highly technical training entered many other fields. Surveys by the American Society of Mechanical Engineers, The Society for the Promotion of Engineering Education, the American Engineering Council, and certain individual universities substantiate this statement. Mr. L. W. W. Morrow in a recent issue of "The Cornell Engineer" cites a study of the records of notable men in "Who's Who," a study made by Mr. Wallace of the American Engineering Council in 1929.

Mr. Wallace studied 28,805 men of whom 30.4% were men of science and engineering, 15% lawyers, and 7.3% physicians and surgeons. The 2,858 engineers and architects held 4,875 official positions in 3,928 organizations, 76% of which were industrial and commercial enterprises. The 2,858 engineers and architects held the position of president in 1,128 industrial and commercial organizations, 72 engineering firms, 68 trust companies and banks, and 23 colleges and universities. In this same group were also 10 governors, 13 members of congress, 2 cabinet members, and a President of the United States.

There is serious question, however, whether his purely technical training of the past is sufficiently broad to enable the engineer to succeed in the future in these diverse fields. To coördinate the efforts of specialists, and thus to engineer through to the ultimate conclusion, some engineering educators believe a greater range of the social sciences should be taught; and their conclusions are based upon factual evidence.

A questionnaire sent out by the Society for the Promotion of Engineering Education, asking what were considered the more serious omissions from college courses, disclosed that over half of the replies from the younger graduates cited economics, business, and commercial subjects. Following are the first seven of these subjects with the number of times they were mentioned:

Business Administration	456
Economics	226
Accounting	179
Psychology	122
Salesmanship and Advertising	118
Industrial Management	104
Production and Production Methods	33

Over ninety per cent of the recent graduates stated that they were not as well qualified to deal with the economic elements as with the technical elements of their engineering problems. Sixty-nine per cent of the graduates of five or more years experience voiced a similar opinion.

This study likewise lists subjects studied since graduation by college trained men employed in six different industries. Some of these subjects were in the specialized field in which the men found themselves employed, but by far the larger number were in the broader fields of business.

In the light of recent developments, an engineer trained only in the physical sciences cannot be expected to appreciate the need for engineering through to the end. He may find himself at a loss in a field where shrewd judgment is required in the solution of problems based almost entirely upon data of a qualitative nature. In a recent discussion concerning this point, a prominent industrialist said: "The thing which distinguishes the highest officer from the man who depends upon quantitative data, is the ability and courage to go ahead and make a decision when quantitative information cannot be had." Thus it would seem that an important part of the modern engineer's training must aim to fit him for non-technical thinking.

Summing up this evidence then, perhaps we should not blame the engineer as much as we should blame the engineering educator who is responsible for his training. This brings us directly to the question: How should the engineer of today be trained so that he will envision the necessity for engineering through to the end? To answer this question I can do no better than to cite the following plan by Professor Herman Diederichs, Dean of the College of Engineering, Cornell University. Professor Diederichs' basic plan for a curriculum is as follows:

1. *The Fundamental Sciences*: Mathematics, Physics, Chemistry, Mechanics, Hydraulics, Thermodynamics.

2. *Professional Studies*: The application of the fundamental sciences to engineering problems; the application of mechanics to machine design and to the design of structures; the application of thermodynamics to problems in power developments; the application of mathematics and physics to the fundamental concepts of electrical theory and practice, etc.

3. *The Social Sciences*: General economics, social history and theory, the study of social adjustments and control, law, psychology, business organization, and methods of management.

4. *Professional Electives*: A comparatively minor group of studies, as far as credit hours are concerned, designed to give the fundamental curricula as laid down under (1), (2), and (3) the desired swing toward specialization in either civil, mechanical, or electrical engineering. Thus we have options in railway engineering, sanitary engineering, hydro-electric engineering, automotive, heat power, or aeronautical engineering, electric power generation, transportation, communication, and industrial management.

5. *A Group of Free Electives*: Designed to permit the student to follow to some extent any special interest he may have; this group should have no professional engineering content.

The enlightening part of this plan is the distinct recognition it gives to the part the social sciences play in the training of engineers. The successful engineer of the future, in my judgment, will not only be a physical scientist, but he will have a distinct appreciation of the social sciences. Recognition of this necessity pours in on us from all sides. In the training of its students, universities must organize to insure earlier consideration of the social and economic effects of scientific discoveries which the physical scientists bring to fruition.

But to become more specific, what are the social sciences and how can they be used in training engineers? "Social sciences" is an inclusive term, and in some respects a misleading one. In its broadest aspect it includes the subjects listed in the Diederichs classification, subjects which comprise, in fact, the science of human relations—economics, the management of men and materials, social history and control, psychology in its practical applications, and other related subjects.

In order successfuly to teach such a group of subjects to engineering students, careful planning, coördination, and control are prerequisites. This statement should be taken for granted, but the reason I make it is that so often college curricula merely grow, one group of course being added after another without any real coördination or plan. First of all, since we are training engineers, the engineering content must be well planned and executed, and should comprise from 65% to 70%. The remaining content may well be devoted to the Social Sciences.

Engineering courses such as these are given at several leading institutions under such names as Administrative Engineering, Commercial Engineering, Business and Engineering Administration, etc. Their content, while varying in detail, follows somewhat the same pattern. My own experience in planning the course at Cornell has given me certain ideas of a basic plan. This plan was arrived at after a careful survey of our own graduates, a study of the various surveys of the several Engineering Societies, and numerous conferences with business and industrial leaders.

Shown schematically the plan of the social sciences and closely related subjects is as follows:

	Sophomore Year	*Junior Year*	*Senior Year*
A	1. Economics	Money & Banking Corporation Finance Accounting (1) Accounting (2) Statistics	 Capstone Course Cost Accounting
	2. Business and Industrial Management (A survey course)		
B	Production Marketing		Factory Planning Industrial Marketing
	Finance Accounting		
C	Psychology and Human Relations	Business Law (1), (2) Psycho-Technology Industrial Relations Sociology, etc.	
	3. English 4. Technical Writing	Public Speaking	

Let us consider each major division of our basic plan. Running through each of the Sophomore, Junior and Senior years there appear to be three central themes or patterns: (a) Economics, (b) Production and Marketing, (c) Human Relations. Actually the demarcations between them are not sharply defined lines, but rather bands or regions in which a certain amount of overlapping is bound to take place. They represent, however, distinct themes carefully planned and coördinated, rather than a series of isolated courses.

The first theme, economics, is of fundamental importance. I believe this statement is acceptable to most of you, but let me illustrate. Within the next month or two installation work will begin on a slender cable between Philadelphia and New York. Developed in the Bell Telephone laboratory and called "coaxial cable," it will be a little thicker than a man's thumb, with a heart consisting of two small copper tubes each with a single wire as its center. Yet it will be capable of carrying some 240 telephone conversations simultaneously, or 2,400 telegraph messages or an entire scene of television! What will be the economic consequences of such an invention? For the present the Federal Communica-

tions Commission has sanctioned the installation on an experimental basis only. When this cable is used commercially, its effect upon the telegraph, telephone, and motion picture industry we can only conjecture.

Closest to the physical side of engineering, so close in fact that there may be a legitimate question as to the propriety of regarding it as belonging in a group with economics, is the subject usually called Engineering Economy. This is the study which deals with that aspect of engineering emphasized in the old definition of an engineer as a man who knows how to build at a cost of one dollar what anyone could build with six. Although meant as a bit of picturesque exaggeration, this definition really comes near to the literal truth. Nearly every engineering problem may be represented in fractional form, with some factor F to be accomplished, as the numerator, but with the inevitable dollar mark as the denominator, i.e., (F/$). The designing engineer is seldom called upon to produce an article simply to meet certain physical requirements; almost always the problem is to design something which will meet physical requirements, and at the same time can be sold profitably within a certain price range. Engineering Economy is, therefore, a part of engineering technology in the narrowest sense of the word.

As to economics proper there are first the basic principles to consider—a study of demand and supply, the analysis of competitive prices, monopoly prices, and the forces which determine these prices, a consideration of governmental activities with respect to industry, etc. Closely connected with these principles and representing a logical outgrowth are money and banking, corporation and investment finance, transportation, labor problems, the problem of taxation, and the study of large scale industry and its governmental control. These in turn are served by accounting and statistics, the tools of the economist, engineer and business man; without a thorough training in their fundamental principles he cannot use a truly factual approach to his problems. While all of these subjects cannot be incorporated in a curriculum that bristles with technical studies, I have indicated the general pattern that I believe essential in the field of economics.

The second theme extended through the Sophomore, Junior, and Senior years comprises production and marketing. These two subjects are closely related, and I prefer to classify them together. Production is the mechanics of transforming materials and labor into goods and services of greater utility; marketing is the process of transferring those goods through commercial channels from the producer to the consumer. In many instances industry fails to maintain a suitable balance and coördination between them; sometimes the marketing and merchandising phases are sadly neglected.

Engineering schools have recognized the need for teaching industrial organization, factory management and related subjects. In doing so they have done an excellent work. In our plan we introduce these subjects in the sophomore year so that the student may be stimulated early in his career concerning industrial policies, plant location, plant equipment, principles and practice of organization, system, production control, time and motion study, costs, wage plans, and other similar subjects. This early stimulation has resulted in reports on visits to industrial plants which, for careful observation, would do credit to seniors.

Throughout this branch of study the philosophy and methods of Frederick W. Tyalor are critically evaluated so that the student may see that while the Taylor system as such may be non-existent today, Taylor principles are widely applied, not only in factory management but also in many other fields. In the senior year definite laboratory problems in factory planning, production control, and cost accounting furnish the capstone to his industrial engineering training.

Similarly the sophomore is introduced to marketing and its related problems, and he rounds out his senior year with courses in Industrial Marketing, Sales Management, Advertising, Sales Law, and Psychology, etc. We feel this is a distinct step forward, since for years the management of most industrial enterprises has been product-minded, when they should have been critically examining their marketing facilities.

This concentration on production has been the natural outgrowth of the seller's market for which they were producing up to 1930. For some time to come I believe industry must face the problem of selling in a buyer's market. Buyer's market, in this case, is interpreted as follows: since many concerns are marketing conscious and are producing products to satisfy the demands of the consumer, the typical organization of the past will not be able to compete even in a period when demand exceeds temporarily production capacity. The competition offered by wide awake concerns will not allow old "take it or leave it" attitudes and products to thrive, although during certain periods they may experience fair business. Haphazard sales methods will not produce the net profit that is necessary for all concerns to continue in business.

Another factor which will be of tremendous importance is the apparent tendency for the population of the United States to become stabilized at about 150-170 millions. If, as predicted, this condition prevails after 1950-1960, manufacturers can no longer look forward to a rapidly growing market; the buyer's market condition will be accentuated.

Emphasis is being placed upon market research, market analysis, and sales planning. The need for more careful planning is indicated by the many white elephants that individual business enterprises have had to bury because of the haste with which new ideas and plans were developed. In searching for new products to keep plant facilities operating at normal capacity, discretion is some-

times thrown to the winds or overshadowed by the enthusiasm of a few individuals for what seems to be a smart idea. Without sounding the market or determining the potential sales in any way, all the expense attendant to development, experimental work, and tooling-up is undertaken. Many times these developed ideas do not result in failure, but one failure may be sufficient to bankrupt the concern and undo all the good work that has been accomplished in years of toil.

As an illustration of this lax planning, the case of a manufacturer successfully making dough-mixing machines for the bakery trade will be cited. This company, located in Pennsylvania, was well known in its particular field and had been prosperous. One day an inquiry was received from a printer who wanted to know whether or not they could or would manufacture a mixer for colored printing inks. From a manufacturing viewpoint, this was a very simple problem, and the manufacturer decided to proceed in the modification of a dough-mixing machine to accommodate the printer. He then looked up the number of printers in the United States and became very enthusiastic about the possibilities in this new field when he found that there were over 36,000 printing establishments.

On this basis of overall figures, he tooled up for heavy production schedules, intending to develop his selling program after the product was ready for shipment. Such a superficial check on the potential market was a very costly one. Instead of having 36,000 potential customers, the list was limited to those printers who did four-colored process printing. This single fact reduced the possible number of outlets so much that the manufacturer found himself with a lot of useless but expensive jigs, fixtures, and equipment.

The third theme of our plan is that of human relations. Our approach in the sophomore year has several advantages. As part of the survey course we introduce the idea of studying men, and we advise the students to begin by studying their classmates. This approach is amplified by lectures, case studies, and written material.

The problems of personnel administration dealing with employment, health and safety, training, service features, and joint relations are discussed and their relationship to industry are developed. These ideas are expanded in the junior and senior years where courses in industrial relations, psychology, psychotechnology, law, and possible electives in sociology and jurisprudence provide for a crystallization of this important theme.

Too often this important work is neglected in college. At a conference of Deans of Engineering Schools, held in New York City in 1928, Mr. O. H. Cheney, Vice-President of American Exchange Irving Trust Bank, said: "Real knowledge of sound management principles as applied to personal relations must be a part of every executive's equipment . . . it isn't merely a matter of being human, it is a problem of being intelligently human. No man is born that way . . ." In much the same vein, Mr. S. A. Lewisohn stated: "Of course, we all hear it said 'Well, the ability to manage men is a matter of innate biological traits . . .' But the difficulty is that those traits are of no value to anyone unless they are developed."

Some years ago Thomas A. Edison remarked, "Problems in human engineering will receive the same genius the last century gave to engineering in more material form." Or viewed perhaps from another angle, the problem is made astonishingly realistic if we consider the words of the personnel director of a large industry who said, "You can strike a ball with a bat and predict within a certain limit what will happen. If, however, you strike a man with a bat you never can tell what will happen."

Consider for example the problem of analyzing the individual. Unfortunately our present industrial system tends to fractionate him, and we do not consider him as an individual in relation to his environment. Rather we tend to consider just one part of him, which we approach through psychological tests (trade or aptitude), or we may even analyze his facial characteristics, or feel the bumps on his head in our lighter moments. Actually the problem is far more involved, and instead of a one-sided affair, I am inclined to believe it is six-sided—psychological, social, economic, physiological, physical, and moral. Thus, a young man about to step into the industrial world may have the psychological and physical requirements for a job, but he may be unable properly to adjust himself to his job because of social, economic, or moral reasons.

The whole turn of investigation in human relations in the industrial field is now in the direction of concrete and direct observation in much the same manner as the foundation was laid in the physical sciences. A recent book by Rexford B. Hersey entitled "Workers' Emotion in the Shop and Home," a study of individual workers from the psychological and physiological standpoint, makes this point of view clear and is a real contribution in this field.

We should admit that the social sciences have much to offer the engineer when he begins to assume administrative duties. While our universities have done splendidly in training the scientific specialist they have only begun the task of training the new administrator.

In the words of William L. Abbott in his presidential address before the American Society of Mechanical Engineers in 1926: "You have long and carefully studied the characteristics of the materials you employ, that your treatment of those materials may best adapt them to the service of mankind. Have you been as considerate of the characteristics of the human bodies and souls that enter so largely and vitally into your products? Herein lies the hope not only of the employer and employee but of society itself."

Correspondence

October 10, 1936

The Editor,
The Cornell Engineer.

Dear Sir:

The Cornell Alumni News for September 24, contained a letter by the writer, which the editor labeled a proposal for the rejuvenation of Engineering at Cornell. The conditions cited are familiar to all engineers namely that in spite of a great past, engineering at Cornell has been quiescent for a long time, while rival schools are outstripping her.

Today I have read the article on Dean Diederichs by Professor Hirshfeld '05 in the October number of your paper, which states the situation more clearly than I have been able to do. Referring to the overloading of the faculty, Mr. Hirshfeld says, "It is now absolutely necessary to lessen the limitations I have referred to. More and better equipment must come from someplace somehow.—Adequate facilities must be provided for research." Then speaking of certain shackles, he concludes with this hopeful statement. "These can be removed if we set our minds and hearts to the task."

It was with similar thoughts that I addressed the Editor of the Alumni News and suggested that in selecting a successor to President Farrand, consideration be given to a technical minded man. To assist him and as Mr. Hirshfeld says to assist Dean Diederichs, I proposed a drive to raise five million dollars for Cornell Engineering. It seemed reasonable to suppose that the 50,000 alumni of the university could accomplish this great purpose. It was also suggested that the organizing of this drive be the climax of Dean Kimball's great career.

Professor Hirshfeld has painted the picture clearly. He has also sounded an appeal that should not go unanswered. Unless immediate and practical plans are made his appeal will go the way the numerous ones we have heard have gone. At the moment I recall a picture of the proposed new C.E. building that seemed imminent in 1910, but has not yet materialized. It is true, as Prof. Hirshfeld says, that we do not need monumental buildings, but we must have funds for salaries, for additional members of the faculty, for the accommodation of more students, and for research.

The 15,000 Cornell engineers now all united in one society properly organized could put Cornell back where she belongs in the engineering world. It must be done soon, or to quote Prof. Hirshfeld again, "neither Dean Diederichs nor any other individual in his place can continue for long the production of engineering graduates capable of maintaining the enviable reputation established by their predecessors." What a tragedy that would be, but how possible it still is to avoid it.

Charles Weiss C.E. '13
201 Jefferson St.,
Valparaiso, Ind.

EDITOR'S NOTE—Many favorable comments on Professor Hirshfeld's article appearing in the October issue of the CORNELL ENGINEER have been received. This has led us to arrange for the reprinting of this article to be sent to all the engineering alumni.

EDITORIALS

OFF TO A GOOD START?

By the time that we reach the last two years of our college life, most of us realize that it is a mistake to try to memorize the formulae, equations, and expressions in our daily work. Unfortunately, at this late date, it is hard to adopt a new system. To the Freshmen and Sophomores in engineering, however, we would suggest a different method of attack.

The whole secret of the solution of any engineering problem is understanding the basic principles of the task. These fundamentals are usually simple in form and derivation, and many of the most complicated formulae are obtained by their application. A logical analysis should be the first step in solving any problem. Set down the known facts, and then proceed to develop basic relations from them. These fundamentals are bound to present an equation or formula by which the example may be solved. Understand the underlying principles, and neither time nor effort will be required to learn by rote these multitudinous formulae.

We are training ourselves here in the fundamentals of science. In practice we may never have the occasion to use these particular equations now at our command, but we will employ the theories behind their results.

Therefore classes of '39 and '40, with these few words of advice, obtained from bitter experience, learn to think! Analyze, don't memorize.

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JUNIOR MECH LAB

It is with a great deal of satisfaction that we look at the changes made in the Junior Mech Lab course for M.E.'s. In the past the course has been given one period a week, with a lecture during the first part of the laboratory period and the experimental work directly following that. As one of the faculty said, "This leaves not only the students but the Instructors as well in pretty much of a daze." This was true. The student had to go immediately into the experiment, without having an opportunity to read his notes and assimilate the matterial. This probably accounts somewhat for the reason that Mech Lab has always been the bane of the engineer's existence.

With the new system Mech Lab calls for two periods a week, a lecture Monday afternoon for all sections, and a laboratory period sometime later in the week. This gives time for the student to read over his notes and to look up references and related material. He comes into the lab period with at least a slight idea about what is going to happen, how to do it, and what points are of primary importance.

The change is decidedly welcome, for it will surely show its worth in an improvement in the quality of reports and longer sleeping hours for those concerned.

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ORGANIZATION OF JUNIOR ENGINEERS

Junior Engineers, those men who are not more than five years out of college, have felt for a long time, a definite need to organize. Very little had been done about it until early this year when the Engineer's Council for Professional Development sent out circulars to some six hundred junior engineers to discover if there was sufficient interest among them to set up an organization made up of only the younger men. A favorable response was indicated when nearly two hundred and fifty of the questionnaires were returned. Tabulation of results showed a diversified interest in such subjects as air-conditioning, business law, differential equations, power plants and a number of other engineering subjects. These subjects were discussed at the preliminary meetings but since this did not supply the demand of those with special interests, smaller groups with interests in particular subjects were formed. One group went so far as to obtain a lawyer from a neighboring college to give lectures on Business Law.

Certainly these men are taking a big step forward in the furthering of engineering progress. No man can call himself educated simply because he has obtained his college degree. The five years after leaving college may mean as much to an engineer as all the entire time spent in obtaining an education. If, during this period, he spends time upon research and further study, he will be gaining a definite toe-hold for the advancement of his career.

We wish to salute this first small group for courage displayed in this organization. They have had the initiative to take the necessary step in the right direction and others should follow, for the benefits derived are not only the additional knowledge obtained through a program of study, but also the chance for self-expression and an opportunity to make personal contact with others in the same profession.

COLLEGE

TAU BETA PI CONVENTION

In the middle of October the Cornell Chapter of Tau Beta Pi shared with the Syracuse chapter the honor of being host to the Annual National Convention of the society. The delegates met in Syracuse on Thursday October 9, where they held meetings until embarking on busses, en route to Ithaca via the famous Krebs at Skaneateles.

The convention's activities in Ithaca centered in Willard Straight Hall, where business meetings were held on Friday morning. In the afternoon inspection trips were arranged through several of the local industrial plants. including the cement works and the nearby plant of the International Business Machine Company.

On Friday evening the formal initiation ceremonies and banquet for the new members of the local chapter were held in Willard Straight Hall. James C. Forbes, '36, acted as toastmaster; Dean Herman Diederichs of the College of Engineering was the main speaker. Frederick F. Sampson, '37, President of the Cornell Chapter, formally welcomed the new members into the society. Henry Page '37 gave the response for the initiates. Those initiated were: John T. Barton ,'37 C.E., Woodward Garber, '37 Arch., Shirley C. Hulse, '37 A.E., Thomas B. Kelley, '37 M.E., Douglas B. King, '37 A.E., Richard W. Kunkle, '37 E.E., Daniel F. MacBeth, '37 M.E., James H. Norris, '37 A.E., Henry A. Page, Jr., '37 A.E., Thomas H. Patterson, '37, A.E., John Schadler, Jr., '37 A.E., John E. Scheetz, '38 E.E., Royal D. Thomas, Jr., '37 Chem. Eng., Herman Van Fleet, Jr., M.E., H. Leslie Walker, Jr., M.E., James W. Wandling, '37 C.E., and Gerald S. White, '37 M.E.

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MC MULLEN SCHOLARSHIPS

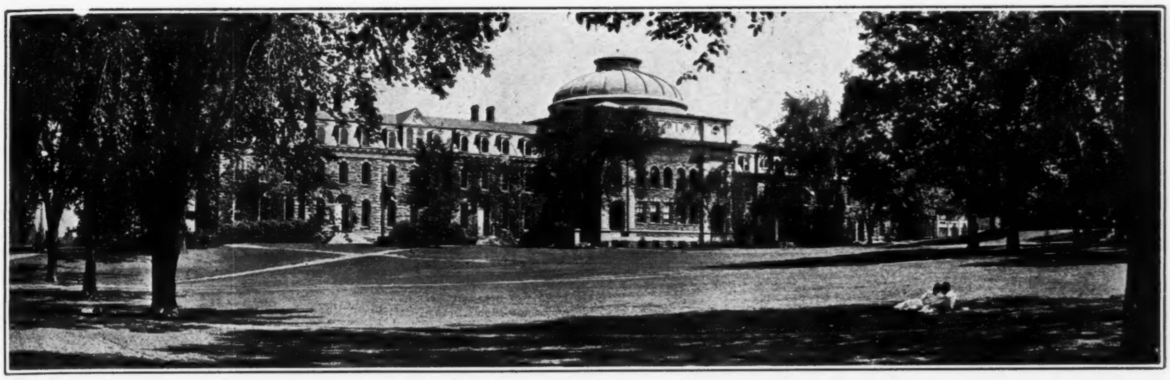
The fall of 1935 saw the introduction of a scheme here at Cornell which, it is hoped, will do much for the school. This was the extension of the McMullen Scholarship system to cover all four years at Cornell, rather than just the last three.

To grant these scholarships, the country was divided into fifteen districts, with a committee of interested alumni in each to choose a promising young man who might enter the Cornell College of Engineering. This resulted in the choice of fifteen men of the class of 1939 each of whom will receive two hundred dollars for each of his years here at Cornell.

The scheme worked so successfully that this year twenty-four men were chosen from prominent high schools throughout the country. At present, they are enrolled as Freshmen engineers. At an as yet unannounced date, a banquet will be given for the men of the Freshman and Sophomore classes who have been awarded these Scholarships.

The following men in the class of 1940 hold McMullen Scholarships:

John Rutherford, Jr., Greenwich, Mass.
Norman F. Moody, Pittsfield, Mass.
Thomas A. Schultz, Baltimore, Md.
Robert Johnson, Chatham, N. J.
Farrand Benedict, East Orange, N. J.
Roland R. Graham, Jr., Westfield, N. J.
John Warren Magoun, Steelton, Pa.
Claude F. Tears, Jr., Warren, Pa.
Frederick Fahnoe, Sharon, Pa.
Wright Bronson, Jr., Akron, Ohio
William T. Ayres, Toledo, Ohio
Charles C. Greer, Zanesville, Ohio
William H. Habicht, Buchanan, Mich.
Kenneth E .Turner, Jr., Pontiac, Mich.
Morgan W. Dawley, Norwich, Conn.
Frederick Gillies Jaicks, Hinsdale, Ill.
Irwin Jerome Kaim, Dallas, Texas
Jesse E. Upp, Tulsa, Okla.
William E. Fisher, Stevens Point, Wisconsin
Bruce E. Nelson, Spearfish, South Dakota
Robert J. Reeves, Denver, Colo.
Edward C. Romine, Casper, Wyoming
William J. Newman, Reno, Nevada
Henry Bruce Hoesly, Spokane, Washington



NOTES

BARNARD TO DIRECT SIBLEY

Professor William N. Barnard, M.E. '97, Head of the Heat Power department, has been appointed acting Director of the Sibley School of Mechanical Engineering. He will temporarily take over the duties of the former director, Herman Diederichs, now Dean of the College of Engineering.

Professor Barnard is well known for his co-authorship with F. O. Ellenwood and C. F. Hirshfeld in writing the book "Heat Power Engineering." He is also a member of the A.S.M.E., Society for the promotion of Engineering Education, Cornell Society of Engineers, Sigma Xi, Tau Beta Pi, Phi Kappa Phi, and Atmos.

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A.S.M.E.

The first meeting of the local student branch of the American Society of Mechanical Engineers was held in room 2 East Sibley on October 15. This was the first opportunity for men in the class of 1938 to attend as members, and President J. Schadler, Jr. '37 urged all interested to affiliate themselves with the organization.

Professor W. L. Conwell of the Civil Engineering School was the speaker for the evening. His topic was the "History and Development of Roads and Highways," illustrated with pictures and slides. For the pleasure of the Mechanical engineers, he pointed out that Mechanical as well as Civil engineers have contributed to a great extent in the progress that has been made in Highway work.

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CHI EPSILON

At a meeting of Chi Epsilon on October 20, the following members of the class of '38 were elected to membership:

C. J. Browne, Avon, N. Y.
R. S. Goodwin, East Liverpool, Ohio
R. M. Reindollar, Baltimore, Md.
D. S. Swenson, Eggertsville, N. Y.
H. A. Weeden, Mount Vernon, N. Y.

Desiring to continue the effectiveness and success of the honor system as practiced in Lincoln Hall, Chi Epsilon plans to spread its ideals among freshmen and students from other colleges. This is to constitute one of the first activities of the society this year.

With the large group of graduate students in civil engineering this term, there arises the problem of increasing the associations between these men and the undergraduates. The Society is tentatively planning to invite the graduate students to a dinner meeting. If this is a success, it will sponsor a smoker for graduates at some later date.

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FACULTY

The last issue of the CORNELL ENGINEER prophesied the announcement of several additions to the Engineering Faculty. At the November meeting of the Board of Trustees the following appointments were made:

In the Mechanical Engineering school former Assistant Professor of Heat Power Engineering C. O. Mackey, '26 M.E., received a full professorship. He is now devoting all his time to the development of a new Senior option on air conditioning. In addition, Professor Colin Carmichael now teaches in the Machine Design Department, and Mr. Cecil W. Armstrong replaces Assistant Professor K. D. Wood in the Mechanics Department. Mr. James Kinney is taking over the duties of S. C. Knight as Instructor in the Machine Design department. The place of Mr. Roland L. Roy, who left the staff to work for Proctor and Gamble, has been taken by Herbert L. Manning as Instructor in Industrial Engineering. Because of the increase in size of the Freshman class this year, Mr. Leo C. Pigage has taken a place on the staff as Assistant, teaching Drawing and Descriptive Geometry.

The School of Civil Engineering announces only two replacements. Professor William E. Stanley replacing Professor H. N. Ogden of the Structural Engineering Department, who has retired; and Harold V. Hawkins is now an Instructor in the Hydraulics Department.

CORNELL SOCIETY *of* ENGINEERS

EDWARD C. M. STAHL '13, PRESIDENT

J. D. TULLER '09, VICE PRESIDENT — S. C. HOLLISTER, VICE PRESIDENT

EDWARD B. KIRBY '25, RECORDING SECRETARY — JOHN P. SYME '26, SECRETARY AND TREASURER

"The objects of this Society are to promote the Welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."

President's Column

November 1, 1936

Fellow Engineers:

Taxing the capacity of the dining room of the Cornell Club of New York the members of the Cornell Society of Engineers and guests met on Wednesday evening, October 14, 1936 for the annual Fall organization meeting. Speeches by Dean Diederichs, Professor W. L. Conwell of the College of Civil Engineering, and Professor John R. Bangs, head of the Department of Administrative Engineering in Sibley College, furnished the highlights of the evening. "Jake" Stahl, '13, retiring President, presided and enlivened the meeting in his inimitable way. John H. Lawrence, '09, reported on the admirable progress that is being made in the establishment of regional chapters of the Society. Illustrating the interest that is being shown he read a letter from one prominent alumnus volunteering his services and suggesting that the alumni could be very helpful in securing advertising for THE CORNELL ENGINEER. This alumnus in his letter further developed the thought that "through the many prominent Cornell Engineers in various parts of the country it might be possible to arrange for the original presentation of very valuable papers" which would increase the prestige of Cornell and THE CORNELL ENGINEER.

Robert W. Gastmeyer, '11, Chairman of the Committee which has been preparing the new constitution, gave a digest of the changes in the new document as compared with the old one.

In the course of that portion of the meeting devoted to the conduct of business, the new constitution was adopted and new officers were elected as follows:

J. D. Tuller, '09 C.E., President
A. C. Davis, '14 M.E., Vice President
W. L. Cisler, '22 M.E., Executive Vice President
J. P. Syme, '26 M.E., Secretary and Treasurer
David Harmon, '31 M.E., Recording Secretary

These officers will serve only until June 1, 1937 as, under the new constitution, the Society year will begin at that time.

The members of the Faculty held the interest of those present. Their remarks indicated a great revival of interest on the part of the Faculty and students in the Engineering College at Ithaca. Dean Diederichs reported increased registration in the University as a whole and Freshman registration in the Engineering Colleges. The increases in the various colleges this Fall as compared with last Fall are as follows: 27% in C.E., 20% in E.E., and 42% in M.E. In reporting on research work the Dean let it be known that he is not one of those who believes that technical progress should be halted. That way leads to stagnation, retrogression and a lower standard of living, he believes and this writer agrees with him. He told of new interests and progress in both M.E. and E.E. and of the plans being made for the expansion of facilities in all the Engineering Colleges. These plans are being prepared so that they will be ready when funds are available. He also told of the trend toward broadening the education of the Engineer. In concluding the Dean, who has been active in the athletic administration of the University for many years, paid a fine tribute to the excellent work that is being done by the present athletic administration under James Lynah, '05. The Dean feels that the outlook for athletics at Cornell is very much brighter. The alumni regional scholarships came in for explanation and it was clearly explained that these are not athletic scholarships; the University is still keeping up the standards that have previously been established in this connection.

Professor Conwell gave a most encouraging picture of progress in the College of Civil Engineering under Director Hollister. He stated that although Lincoln Hall had undergone little or no change externally, nevertheless, there were many significant changes within the College. Among these he cited the new photo-elastic laboratory, the new equipment for Professor Walker's work in microscopy in Sanitary Engineering, a new Soils Laboratory in the basement of Lincoln Hall, and a new 300,000 lb. Southwark Emery universal testing machine. He referred to the appointment of Mr. William E. Stanley as Professor of Sanitary Engineering following the retirement of Professor H. N. Ogden. He also described

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President's Column

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the work done by Professor Hollister in persuading the U. S. Army Corps of Engineers to locate at Cornell their laboratory for the investigation and control of soils for earth dam construction on flood control projects in New York State. The College of Civil Engineering has been requested by the U. S. Army Corps of Engineers to coöperate with them on flood control projects and is beginning the construction of models to study flood conditions, erosion and remedies. The College of Civil Engineering now has 47 graduate students. Professor Conwell stated that the effect of such a group of graduate students was most stimulating in-so-far as the Faculty was concerned.

Professor Bangs opened his talk with interesting reminiscences of things athletic, in the course of which he referred to the shortest Cornell poem—"The crews row; on H_2O." He told of the problems facing those teaching Engineering at Cornell. Professor Bangs is a member of the Faculty Personnel Committee and as such he gave some very interesting recommendations that are under consideration, all looking towards higher standards for the Faculty. One of those, particularly interesting, is as follows: "Promotion should not be automatic. Department heads should be charged with the duty of impressing on members of their staffs that mere seniority and length of service will not lead to advancement. Promotions should not be made except when recommended by the Committee on Faculty Personnel after it has made a review of the record and qualifications of the man concerned. This should apply to all grades."

Concerning employment Professor Bangs made some very encouraging remarks. He stated that "the opportunities for young men qualified to take engineering are the best they have been in many years. The opportunities for getting real jobs have increased amazingly in the last year or so." Professor Bangs gave the result of a study he has just made concerning employment covering 879 graduates from the classes of 1928-1935. This showed that the men had found employment in 38 different lines of work. Professor Bangs' comment was "I am amazed at the versatility of our men."

Those of you who are able to attend these meetings and do not do so are passing up an opportunity.

Sincerely,

J. D. TULLER *President*

EDITOR'S NOTE—A last minute notice tells us that the Society is coöperating with the committee in charge of the dinner to be given for President Farrand in December. The December meeting of the Society is being omitted and it is strongly urged that all members attend President Farrand's dinner.

Alumni Notes

'01 CE—Roger B. Williams, Jr., an investment banker and engineer, married Sara T. Mero. Mrs. Williams is treasurer of the Women's Bar Association of the District of Columbia and an attorney with the firm of Esch, Kerr, Taylor and Shipe in Washington. The couple may be reached at 400 Madison Avenue, New York City.

'06, '08 ME, '10 MME—George W. Lewis, who received the Daniel Guggenheim Medal in 1935 for his work in behalf of Aeronautics, was in charge of the annual engineering conference at Langley Field last spring.

'07 ME—Walter S. Wing has been elected vice-president, and continues as general manager of the Pennsylvania-Dixie Cement Corporation in New York City.

'11 ME—Winton G. Rossiter is a member of four standing committees of the New York Stock Exchange. They are the committees on Admissions, Arrangements, Constitution, and Finance.

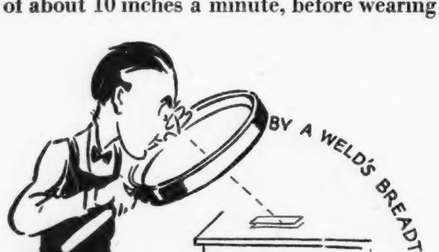
[redacted]

G-E Campus News

ALL-AMERICAN DRILL

The guards on a football team usually take a terrible beating. Coaches often pay tribute to the courage of their guards and marvel at their stamina. Wonder what they would say of one particular hard-headed drill that grinds and plugs away for General Electric in the fractional-horsepower-motor section of the Fort Wayne works. Here's the story:

A couple of years ago, this drill started buzzing around, drilling holes for motors and flanges. It was tipped with Carboloy, a development of General Electric research, and plenty tough. Result—it established a combination speed and durability record by completing 100,247 holes each 1 11/38 inches deep. During the years of its service, it penetrated approximately 2¼ miles of cast iron, at the rate of about 10 inches a minute, before wearing out!



SOMETHING REALLY THIN

Until recently, "by the skin of your teeth" was the very peak of thinness. General Electric, however, now makes a strong bid for a new figure of speech: it is "by a weld's breadth." Engineers at the Schenectady works recently welded together strips of two alloys, Copnic and Chromel, and then rolled them to a thickness of six millionths of an inch.

The material formed by this junction has a very small heat capacity and will respond rapidly to a change in temperature. Engineers estimate that a pound of this product would cost several million dollars.

Gold has been beaten to four millionths of an inch thickness, and aluminum has been thinned by the same treatment to ten millionths of an inch; but this is the first time two alloys have been reduced to such a thin section by rolling. The feat was achieved by placing the welded strips of alloy between pieces of steel and rolling the complete assembly. The product is not yet manufactured for general sale.

General Electric engineers, working with all the facilities of G-E research laboratories, are daily producing new processes and new applications that make for future progress.

HARD ON THE OX

Residents of Duanesburg in Schenectady county, New York, killed and roasted their plumpest ox recently in order properly to celebrate the opening of the world's longest stretch of sodium-lighted highway. But the ox could feed only a small part of the crowd that turned out to see the sight. Shortly, at a signal picked up by an electric eye, the road glowed out clearly in the darkness. The soft, glareless light of 391 G-E sodium lights made of it a real Golden Road, 18 miles long.

Fifteen thousand people watched the celebration and listened to New York's Commissioner of Highways, Arthur W. Brandt, point out some of the savings that good highway lighting gives. They heard the figures in the case of an early lighting installation made by General Electric—a six-mile section on the well-traveled Albany-Schenectady road. Night accidents have decreased there 40 per cent. Day accidents on the other hand have increased 13 per cent.

These stretches of lighting greatly reduce the hazard in night driving. Another major installation will be opened this fall on the San Francisco-Oakland Bay bridge where 900 units will illuminate both decks of the span. Sodium lighting has been developed to its present efficiency by General Electric engineers.

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